PATENT COOPERATION TREATY

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To:

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PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (page 2)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/DE2004/001267	4/7/2004	4/17/2003

International Patent Classification (IPC) or both national classification and IPC
F02M25/07, F02D35/00, F02D41/22, F02D21/08

Applicant
Robert Bosch GMBH

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☑ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☑ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☑ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/	Authorized officer
	Trotereau, D
Facsimile No. EV323021452	Telephone No.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/DE2004/001267

Box No. II Priority

1. ☑ The following document has not yet been furnished:

   ☑ copy of the earlier application whose priority has been claimed (Rules 43*bis*.1 and 66.7(a)).

   ☐ translation of the earlier application whose priority has been claimed (Rules 43*bis*.1 and 66.7(b)).

   Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Trotereau, D

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/DE2004/001267

Box No. V **Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	2 - 10	YES
	Claims	1	NO
Inventive step (IS)	Claims	5,6	YES
	Claims	1-4, 7-10	NO
Industrial applicability (IA)	Claims	1 - 10	YES
	Claims		NO

2. Citations and explanations:

see supplementary page

Regarding Item V:

1. Reference is made in this Report to the following documents:

D1: US 5 617 833 A (TOMISAWA NAOKI ET AL) April 8, 1997

D2: PATENT ABSTRACTS OF JAPAN Vol. 1998, No. 4, March 31, 1998 & JP 9 317568 A (NISSAN MOTOR CO LTD) December 9, 1997.

2. INDEPENDENT CLAIM 1

2.1 The present application does not meet the requirements of PCT Article 33(1) because the subject matter of Claim 1 is not novel as defined in PCT Article 33(2).

Document D1 discloses (citations in parentheses refer to this document):

A method for monitoring the exhaust gas recirculation (*diagnosing an exhaust gas recirculation system*, Claim 1) of an internal combustion engine by pressure sensing (*combustion chamber inner pressure*, Claim 3),
in which exhaust gas is recirculated from an outlet side of a combustion chamber assemblage via an exhaust gas recirculation conduit (ARK) to an inlet side of the combustion chamber assemblage (Figure 1), wherein
a pressure curve is sensed in at least one combustion chamber (*combustion chamber inner pressure*, Claim 3),

and a thermodynamic parameter is ascertained therefrom as an actual value (the *combustion time duration* in Claim 1 characterizes the combustion process and can therefore be regarded as a thermodynamic parameter. See also *heat generation quantity*, col. 10, lines 14-21),
a target value of the parameter, which target value takes into account the current operating point of the internal combustion engine, is made available (*predictive combustion time duration determining means for determining a target recirculation rate*, Claim 1)
and a deviation between target value and actual value is determined (*comparing the length of the combustion time durations*, Claim 1) and

a datum regarding the current exhaust gas recirculation state, as compared with its normal state, is obtained from the deviation (*diagnoses that a failure occurs*).

The method of Claim 1 is therefore not novel as defined in PCT Article 33(2).

2.2 The applicant is additionally referred to document D2.

In D2 the *actual EGR rate*, which is ascertained by way of a *model which models a combustion phenomenon in the cylinder*, can be regarded as a thermodynamic parameter.
The subject matter of Claim 1 is therefore also not novel, as defined in PCT Article 33(2), in consideration of D2.

3. DEPENDENT CLAIMS 2-4, 7-10

The additional features contained in Claims 2 and 4 are rendered obvious by D1 (col. 10, lines 14-21), and the additional features contained in Claims 3, 7-10 are actions common in the art. Claims 2-4, 7-10 therefore contain no features that, in

combination with the features of any claim to which they refer, meet the requirements of the PCT with regard to novelty or inventive step.

4. DEPENDENT CLAIMS 5, 6

Claims 5 and 6 differ from the prior art in terms of the details of calculating the heat curve and the energy conversion point.

The object is a precise determination of the conversion of the fuel.

The ways in which this object are achieved in Claims 5 and 6 are neither known from nor rendered obvious by other documents.

The feature combination contained in dependent Claims 5 and 6 is therefore novel and inventive, and Claims 5 and 5 **[sic]** meets **[sic]** the requirements of PCT Article 33(2) and (3).

Box IV: Wording of the Abstract (continuation of item 5 on sheet 1)

The invention refers to a method for monitoring the exhaust gas recirculation (AGR) of an internal combustion engine by pressure sensing, in which exhaust gas is recirculated from an outlet side of a combustion chamber assemblage via an exhaust gas recirculation conduit (ARK) to an inlet side of the combustion chamber assemblage. Reliable monitoring of the exhaust gas recirculation with relatively little complexity is achieved by the fact that a pressure curve is sensed in at least one combustion chamber (ZYL1 ... ZYLn) and a thermodynamic parameter is ascertained therefrom as an actual value; that a target value of the parameter, which target value takes into account the current operating point of the internal combustion engine, is made available, and a deviation between target value and actual value is determined; and that a datum regarding the current exhaust gas recirculation state, as compared with its normal state, is obtained from the deviation.